

TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE
SERVICE

SOIL CONSERVATION

STATE OFFICE STILLWATER, OKLAHOMA 74074

PLANT SCIENCE TECHNICAL REFERENCES - FOR IN SERVICE USE ONLY

AGRONOMY - OK-5

September 17, 1974

Re: Legumes for Pastures

Now that nitrogen costs are high there is considerable interest in the nitrogen fixing ability of legumes in a pasture program to improve the quality of forage available to the grazing animal. Some basic facts about legumes and their nitrogen fixing ability should be kept in mind when planning a pasture program based on grasses and legumes.

A ton of good quality forage (whether it be grass or legumes) which tests 12.5 percent crude protein will contain approximately 40 pounds of actual nitrogen. If the forage tests 18 percent crude protein, as many legumes will, then a ton of this forage will contain about 60 pounds of nitrogen.

Hairy vetch, one of the most widely adapted pasture legumes in Oklahoma, has been reported to fix from 75 to 120 pounds of nitrogen per acre. If hairy vetch produces 2 tons of 18 percent crude protein forage per acre this uses 120 pounds of nitrogen per acre. The point is that most of the nitrogen which is fixed by legumes will be used by the legume plant for its own growth. A small amount of nitrogen will be left over to stimulate the growth of associated grasses. This nitrogen can come from the leaves of the legume plant which are lost during the harvesting process and from the decaying root system after the legume plant has died. If the legume plant is not harvested for hay or is not grazed, then more nitrogen will be available for later use by grasses growing in association with the legume.

Special attention must be paid to the soil acidity, phosphorus levels and the potassium levels. The only way to accurately determine these levels is to have a soil sample analyzed. Most legumes will grow better when the pH is closer to neutral, 6.5 to 7.0. Liming is the only way to correct a low pH of the soil.

Legumes are more sensitive to low phosphorus and potassium levels in the soil than are grasses. Applications of phosphorus and potassium should probably be increased by 50 percent for optimum legume growth. In order for nitrogen fixation to take place legumes must be inoculated with the proper bacteria, especially if the legume has not been grown recently. Each species of legume has a specific bacteria which will live on the roots to fix nitrogen.

A grass-legume pasture will provide a high quality forage available to the grazing animal. This is often reflected in better condition of cows and more rapid gains with growing calves.

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At times it can be advantageous to grow a cool season legume with a warm season grass (vetch-bermuda for example) or a warm season legume with a cool season grass (lespedeza-tall fescue). This reduces the direct competition for moisture and nutrients. It also keeps a pasture producing for a longer period of time during the year. The hazard of mixing cool and warm season species is the increased risk of bloat if animals are grazing a predominately legume pasture.

Nitrogen fertilizer can be used with a grass-legume mixture to maintain a more even supply of high quality forage. After winter annual legumes have produced seed, nitrogen can be applied in June or July to stimulate grass growth. Lespedeza-grass pastures can be fertilized in August to promote September grass production.

Costs need to be considered. An example using vetch as the legume:

40 pounds of P_2O_5	X	\$0.25 =	\$10.00
60 pounds of K_2O	X	0.12 =	7.20
Lime @ \$3 per year		=	3.00
15 pounds vetch	X	0.32 =	4.80
Tractor and drill rental		=	4.50
			<hr/> \$29.50 per acre

Hairy Vetch: Probably the most widespread pasture legume in Oklahoma. It is adapted to a wide variety of weather conditions and can produce an excellent hay crop or grazing. A sound rotation grazing program would be very beneficial for managing hairy vetch so the growth does not get ahead of the grazing livestock. As the vetch plants approach maturity they become less palatable to grazing animals and should be cut for a hay crop or cut and let lay to prevent shading of the grasses, especially bermudagrass. Vetch growth which is not removed from the bermudagrass pasture has been shown to supply the equivalent of 75 to 100 pounds of nitrogen per acre to stimulate later bermudagrass growth.

Hop Clovers: Provides 4 or 5 weeks earlier grazing in bermudagrass in eastern Oklahoma in the spring of the year. They will fix enough atmospheric nitrogen for their own growth but there is very little left over to stimulate grass growth even if the hop clover is not removed from the field.

White Clover or Ladino Clover: Adapted to special areas on many livestock farms in eastern Oklahoma. It will generally survive on upland soils in eastern Oklahoma where the rainfall distribution pattern, with 40 inches or more rainfall, is adequate provided the soil nutrient requirements have been

met. It is very tolerant of low wet areas and will survive in these areas where most other legumes will not. This makes a mixture of white clover and tall fescue very well adapted to the low wet areas. Grazing management to maintain white clover will require a rotation grazing program to never let well established fescue get over 10 inches tall. Shade and competition from grass will quickly eliminate white clover if the grass is allowed to get too tall. It will start growth about 2 months earlier in the spring than bermudagrass.

Alfalfa: Requires a well drained soil as it will not tolerate "wet feet." After about 3 years of grazing it will disappear from the mixture. It is not well adapted to frequent close grazing.

Red Clover and Crimson Clover: Both are short season legumes. They mature relatively early and quite rapidly. Even though they will tolerate some soil acidity they make their best growth at a pH of 6.5 to 7.0. Reseeding, either natural or planned, will be necessary to maintain a stand.

Sweetclover: Extensively used in Oklahoma several years ago as a soil building crop. It could probably fit in again in some pasture-legume programs. There are problems with getting the first year's growth of biennial clover through the dry periods which often come during the summer. The white blossomed biennial sweetclover will produce more growth than will the yellow blossomed, but the yellow blossomed clover is less stemmy and therefore more palatable to livestock. Annual sweetclover, such as hubam, can be planted in the spring of the year and it will mature in early summer. It usually produces large amounts of forage but the root system is not as extensive as the biennial sweetclover.

Arrowleaf Clover: Well adapted to the pasture programs in a large part of southeastern United States. Research with Amclo, Yuchi and Meechee under Oklahoma conditions is not complete at this time. Amclo is the earliest maturing variety and will mature some time in May. Yuchi is a medium maturity variety and will mature in early June. Meechee is 2 or 3 weeks later maturing than Yuchi and is also considered to be slightly more winter hardy. Arrowleaf clover will make a good growth on soils with a pH of 6.0 to 7.0. It is a winter annual species and can be seeded in the fall. Grazing management and proper fertilization are two important factors in maintaining stands and production in perennial grasses such as bermuda. There is a high percentage of hard seeds so the first seeding should definitely be with scarified seed.

Annual Lespedezas: Can be used to good advantage for high quality summer grazing. Korean lespedeza will start growth earlier in the spring than Kobe but Kobe is more tolerant to slightly acid conditions. Neither will be maintained in a pasture which receives over 50 pounds of actual nitrogen fertilizer per acre in the spring of the year.

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Sericea Lespedeza: A perennial that needs to be grazed or harvested for hay when it is 12 inches tall or less. The quality declines very rapidly as it starts to mature. It becomes stemmy and of little value for grazing or hay.

Legumes for Pasture Mixtures

Legume	Seeding Rate Lbs/Acre	Seeding Date
<u>Winter Annual</u>		
Hairy Vetch	10-20	
Hop Clover	1-3	Sept.1 - Oct.15
Arrowleaf Clover	4-8	Sept.1 - Oct.31
Red Clover	4-6	Sept.1 - Oct.31
Crimson Clover	5-10	Sept.1 - Oct.31
		Sept.1 - Oct.31
<u>Cool Season Perennial</u>		
White Clover	1-2	
Alfalfa	4-6	Sept. 1 - Oct. 31
		Sept. 1 - Oct. 15
<u>Summer Annual</u>		
Annual Lespedeza	10-15	
		March 1 - Apr. 15
<u>Summer Perennial</u>		
Sericea Lespedeza	10-15	
		March 1 - May 15

/s/ Hampton Burns
Hampton Burns
State Conservationist